



Ames Project EXcellence (APEX)

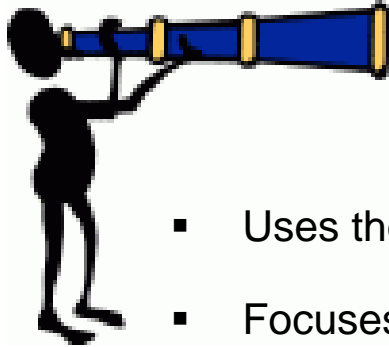
An Innovative Experiment in Action Learning



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NASA Ames Research Center
March 2006

Topics

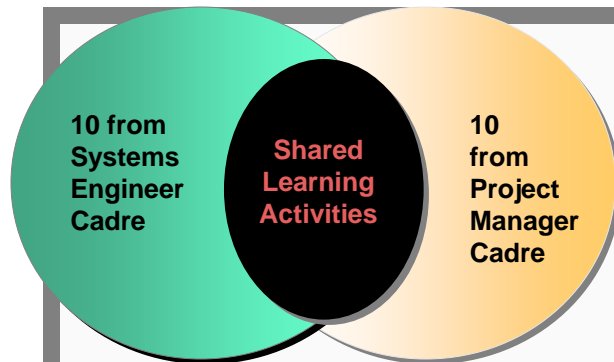
- **What is APEX?**
- **Drivers for the Program**
- **Design Concepts and Core Features**
- **Launching the Program**
- **Summary**



What is APEX?

An Innovative Experiment in Action Learning

- Uses the participants' project environment as a *Learning Laboratory*.
- Focuses on increasing participants' ability to *execute* project management and systems engineering.
- Applies an integrated, *systems* approach to learning and development.



Pilot Year Objective

Graduate twenty practitioners



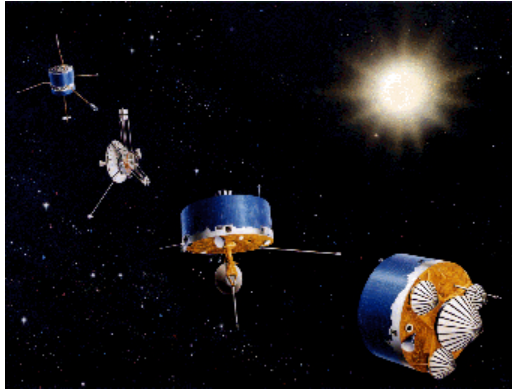
Demonstrating a *measurable* increase in their project management and system engineering capabilities.



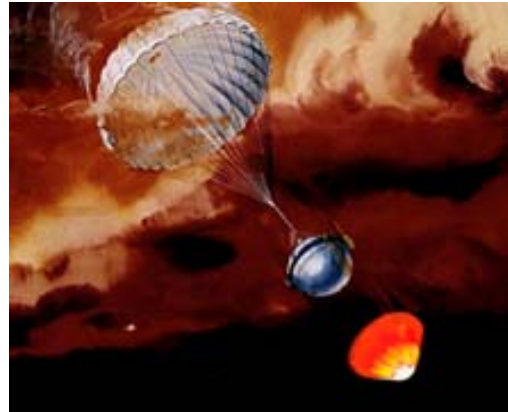
Drivers for the Program

[illegible]

Rich History of Mission Management at ARC



The Pioneer 6-11 and Pioneer Venus Program 1965-2003 :
A series of projects considered models of science driven, cost effective missions



Galileo Probe 1995 (entry):
Entered Jovian atmosphere to return first data ever of the interior of Jupiter



Lunar Prospector 1995-1999:
Discovery class mission returned global mapping data of the Moon's gravity and resources, including water ice at both poles



Kuiper Airborne Observatory (KAO) 1975-1995:
World's first major airborne observatory



Infrared Astronomical Satellite 1983:
Performed unbiased, sensitive all sky survey at 12, 25, 60 and 100 micrometers

New Work Drives Need for APEX

FY 06

FY 07

FY 08

Programs and Projects:

Robotic Lunar Exploration Program Office

RLEP Mission #2, #3, n

CEV Work Packages: TPS/EDL, IVHM, Aero-Sciences

Next Generation Air Traffic Management

Science Mission Proposals/Projects:

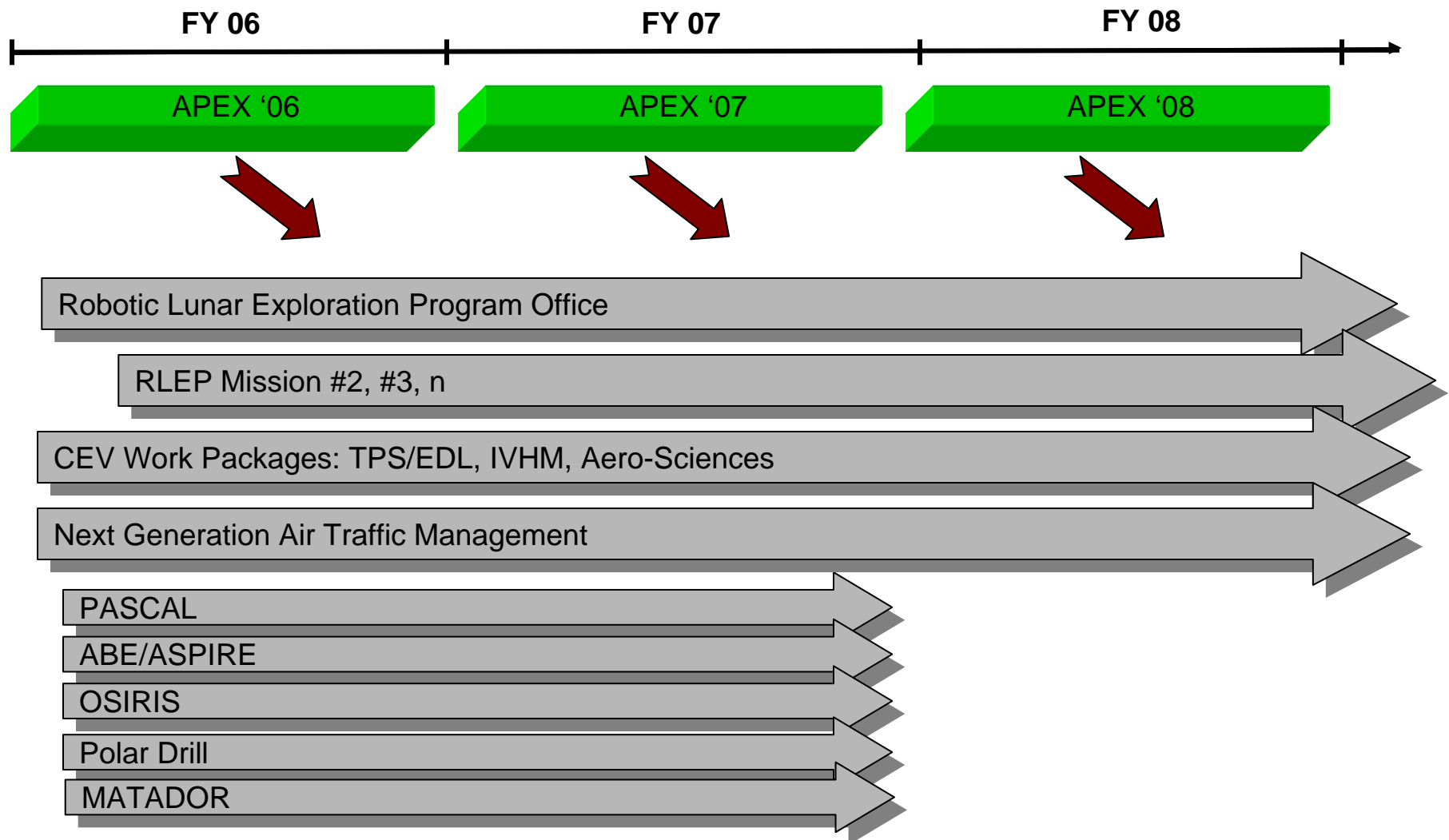
ABE/ASPIRE

OSIRIS

Polar Drill

MATADOR

APEX Will Enhance the Pool of PM & SE Talent



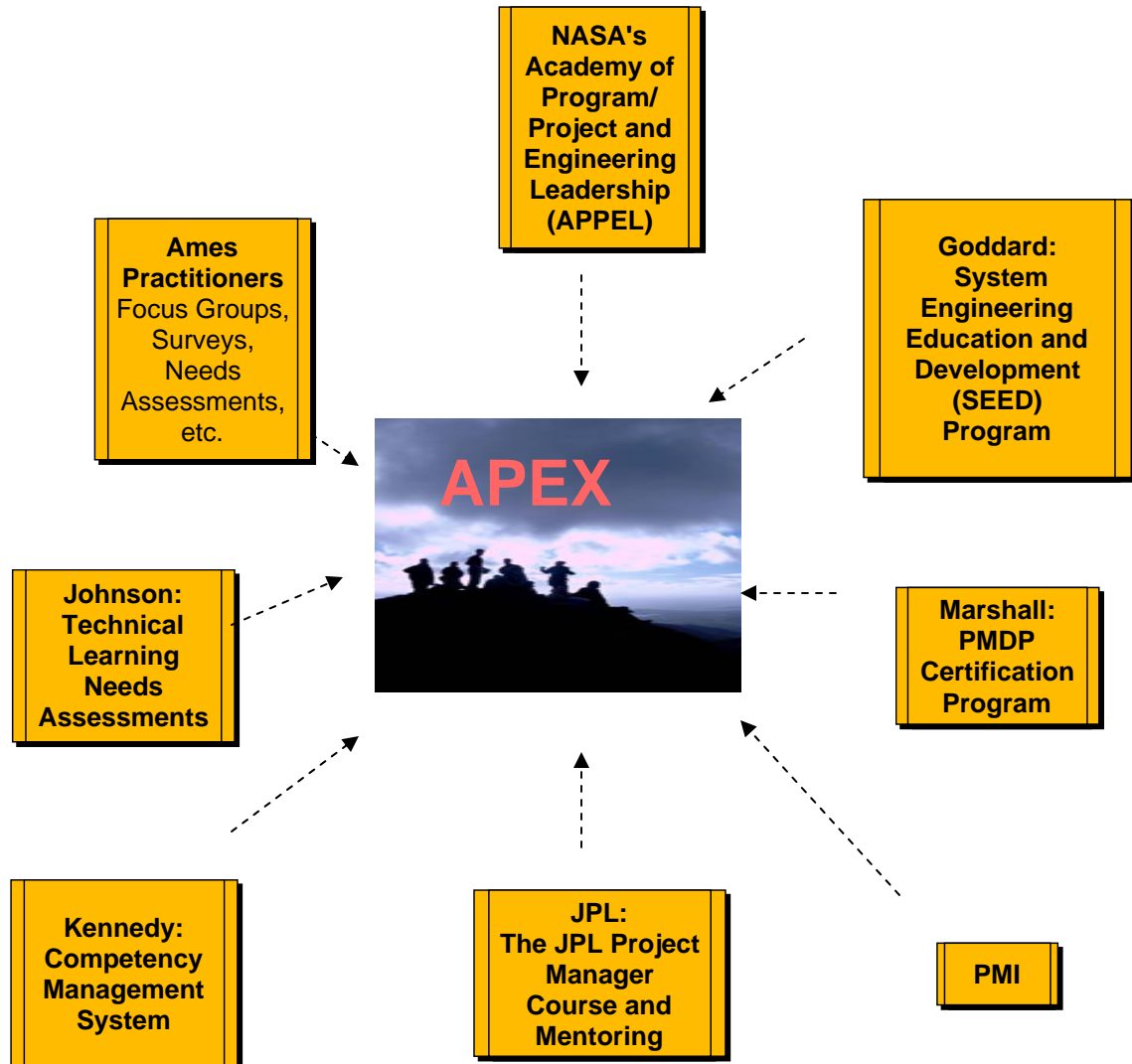


Design Concepts and Core Features

Design Concept

Core Feature

**Learning
From
Others**



Design Concept

**Engage and Involve
the whole community**



Core Feature

- **Ames Senior Leadership** reviewed and approved APEX design. Selected final participants.
- **Ames Technical Organizations** have representatives on APEX Development Council.
- **Project Practitioners** serve as APEX Mentors.

Design Concept



Focus

on

Enhancing the *Execution*
of project management and
systems engineering
responsibilities.

Core Feature



Defined Core Competencies

- **APEX PM** (Project Management) Matrix
- **APEX SE** (Systems Engineering) Matrix

Defining high priority critical tasks associated with each competency.



Ames Research Center

in Silicon Valley



Project Manager Matrix Profiles

Level	Description
1	A Level 1 Program Practitioner is responsible for managing a large, high profile project, a series of complex systems, and/or a defined NASA program consisting of one or more projects. They demonstrate a strategic vision for the innovative application and integration of NASA project management concepts to accomplish program mission.
	A Level 2 Project Practitioner is responsible for the management of a large or small project that is a complete, stand-alone effort; a complex project or series of systems with subordinate subsystems and interfaces. They demonstrate the successful ability to integrate NASA project management concepts; processes; tools and techniques across subsystems at the project level.
	A Level 3 Project Practitioner has responsibility and accountability for managing aspects of a portion [subsystem or element] of a project, OR may be responsible for comprehensive management of a small project. They demonstrate the successful ability to apply project management concepts, processes, tools and techniques at the subsystem/element/task level.
4	A Level 4 Project Practitioner is an active, contributing member of a project team, serving in roles such as a discipline/technical expert; systems engineer; project scientist, etc. A level 4 practitioner may also serve in project support roles, e.g. business management, procurement, contracting, finance and resources management. They demonstrate awareness and comprehension of NASA project management concepts, processes, tools, techniques and lexicon.

Structure of The APEX Core Competency Matrix

Profiles

Systems Engineer Matrix Profiles

Level	Description
	Level 1: Serves as a Lead Systems Engineer for a project or large subsystem [may also be called the Chief Engineer]. Prepares and implements the Systems Engineering Management Plan (SEMP) for a project or large subsystem. Ensures cost-effective choices for system performance, life cycle costs, risk, technology, schedule, safety, operations, logistics and infrastructure. Defines key performance parameters (KPPs) related to project success, and specifies quantitative verification and validation.
	Level 2: Serves as a Systems Engineer for a Subsystem [e.g. Instrument & Payloads] or small project. Prepares and implements assigned portion of the Systems Engineering Management Plan (SEMP), throughout subsystem life cycle.
3	Level 3: Serves as a Subject Matter Expert and/or lead for a particular component/discipline development (e.g. power, propulsion, etc.). Has a practical understanding of systems engineering processes and tasks. As necessary, supports system engineers in applying systems engineering processes to particular tasks/activities.

Focus of APEX Pilot Year



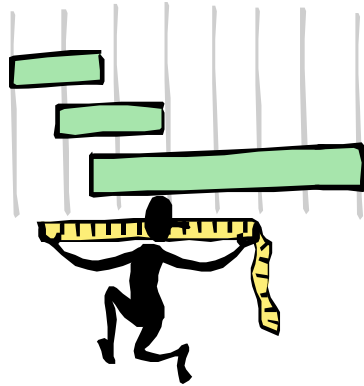
- Defined Core Competencies
- Defined Critical Tasks

For each profile

SE Core Competency Categories	Core Competencies	Sample Critical Tasks		
		Discipline Engineer	Sub-System Systems Engineer	Lead Systems Engineer
1.0 Advanced Studies	1.1 Trade Studies The identification, modeling, and evaluation of mission alternatives.	1. Perform engineering trade offs for specific subsystem component/discipline as part of a proposal/concept team.	1. Lead others in performing engineering trade offs of system or subsystem component/discipline as part of a mission proposal/concept team.	1. Direct others in preparing possible missions concepts. 2. Determine trade space boundaries and set evaluation criteria for rating and selecting concepts.
	1.2 Proposal Development The documentation and presentation of relevant advanced studies products (preliminary technical approaches, costs, schedules) such that the specific requirements described in a mission/business opportunity are addressed.	1. Prepare proposal content relative to a specific component or discipline by performing engineering analysis, interface definition, and cost and schedule estimating.	1. Prepare proposal content relative to a subsystem by performing/directing engineering analysis, interface definition, and cost and schedule estimating.	1. Lead the development of the technical portion of a proposal. 2. Review and approve proposal content prepared by subsystems and component specialists.



Design Concept



Apply Rigor to Results

- Define specific, success criteria (*graduation requirements*).
- Define Milestones
- **Measure** Progress

Core Feature

APEX Online



- **Assessment Tool** establishes participants' *current level of capability* to execute critical tasks.
- **Individual Development Planning (IDP) Tool** documents milestones, identifies development activities and reflects increase in capability levels.



Category 1.0 Project Conceptualization and Planning

[View Your Profile Matrix](#)

Competency 1.1 NEW BUSINESS DEVELOPMENT

1 of 40

Critical Task 1. **Contributes subject matter expertise at the subsystem level in support of new business development.**
[1 of 1]

1: Assess Your Capability Level For This Task:

Please review the descriptions of the 3 capability levels. Then, from this menu, please select the capability level that *best describes* your highest level of expertise in executing this task:

--Select-- [Level Descriptions](#)

Developing

Limited or no understanding of the concepts and practices associated with this task. Has limited or no experience in executing this task.

Functional

Demonstrates a comprehension of, and can define, the concepts and practices associated with this task. Has applied knowledge to routine situations and has executed task with guidance from a more experienced practitioner.

Proficient

Demonstrates a breadth of knowledge and skills for executing task successfully. Consistently demonstrates ability to analyze and adapt knowledge to complex situations without guidance.

2: Provide Supporting Evidence for Your Self-Assessment:

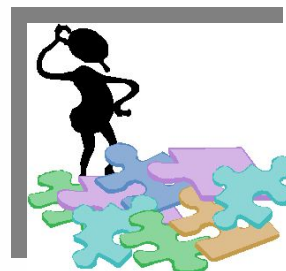
A: Identify the most recent project where you executed this task at the level you selected. Briefly outline your core activities, and name any product or outcome that resulted from your performance of this task:

B: Briefly explain why you selected the capability you choose and **NOT** the level above or below it.

[example](#)

Save and Exit

Next Task >>



APEX Online

Participant

Self-Assessment

Sample

APEX Online



Assessment Report

Reviewed by Supervisor and APEX Mentor

Core Competency	Critical Task	Self-assessed capability level	Supporting Evidence: Experience	Supporting Evidence: Capability Level	Supervisor Comments	Mentor agreed Capability Level
1.1 NEW BUSINESS DEVELOPMENT	1. Contributes subject matter expertise at the subsystem level in support of new business development.	Developing				
1.2 BID & PROPOSAL	♥ Contributes to and manages the development of a subsystem's technical, cost, and schedule aspects as part of an overall project proposal.	Functional				
1.3 REQUIREMENTS DEVELOPMENT & MANAGEMENT	♥ Defines, verifies, reviews and maintains requirements and specifications through functional analysis, technology feasibility, availability, readiness and decomposition from top-level requirements.	Functional				
	♥ Participates in requirements change control for the subsystem and balances requirements changes with subsystem cost and schedule.	Proficient				
1.4 PROJECT PLANNING & SCHEDULING	♥ Develops a work breakdown structure for a system/subsystem.	Proficient				
	♥ Contributes to and integrates plans, schedules, and cost estimates for a subsystem.	Functional				
1.5 ACQUISITION STRATEGIES	Evaluates and recommends the best acquisition approaches to accomplish the subsystem development and deployment.	Developing				

APEX Online



Individual Development Plan (IDP)

1.2 BID & PROPOSAL

Sample

Critical Task Description
Critical Task: Contributes technical expertise to bid and proposal development processes.

Beginning Capability Level: Functional

Development Objective: Proficient

Add: [Course/Workshop](#) [OJT Development Assignment](#) [Mentor Activity](#) [Other](#)

Current Development Activities					
Description	Type	Milestone	Status	Verified	Action
Course	Course	4 Month	In Progress	N/A	View/Edit
OJT	OJT	4 Month	In Progress	N/A	View/Edit
Stretch Exercise	Mentor	8 Month	Completed	No	View/Edit
other	Other	12 Month	Completed	Yes	View/Edit

Milestone Reviews before APEX Development Council

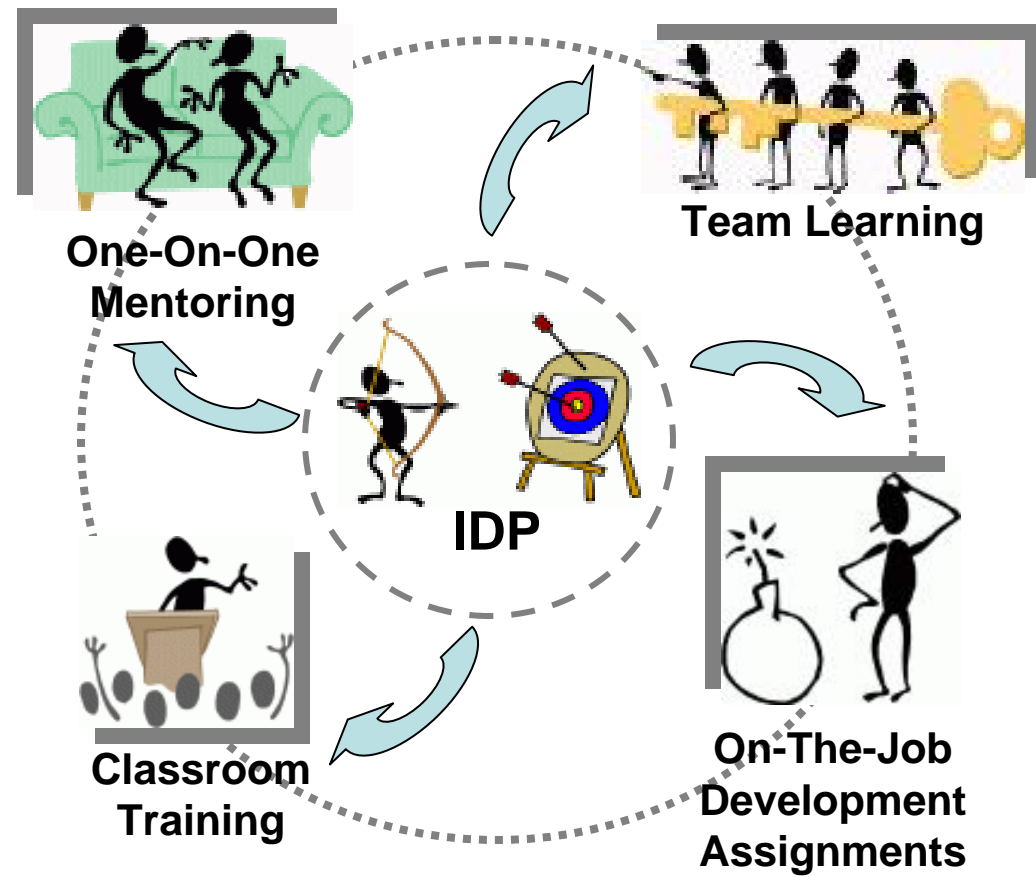


Core Feature

Design Concept

Apply and Integrate

best practices in
learning and
development



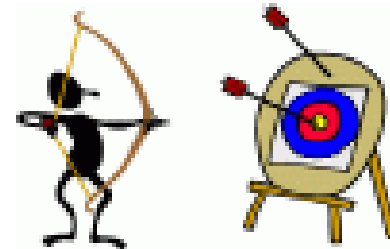
Learning By Doing



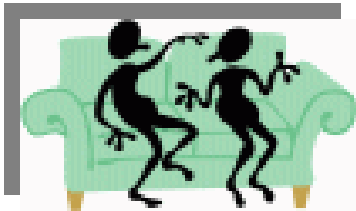
**On-The-Job
Development
Assignments**

Designed to:

- **Accomplish specific IDP objectives.**
- **Enhance participants' ability to execute critical tasks.**

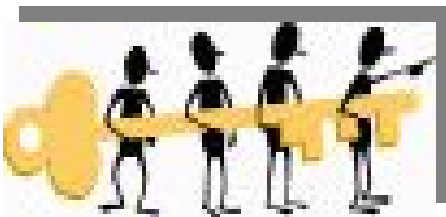


- **Real Project environment as “learning lab”, e.g.**
 - ☐ Participant's home project
 - ☐ Mentor's home project



One-On-One Mentoring

- Experienced Ames' project manager and systems engineering **volunteers**.
- Mentoring partnership supported through matching process and training for mentors and protégés.



Team Learning

- Cross-organizational participant teams, led by external, expert practitioners (PM and SE).
- Designed to develop and support **Community of Practice**.

- IDP-based and “Stretch” Perspective.
- Development assignments and exercises.
- Lessons-Learned and case studies.
- Networking experiences.
- Reflection, discussion and debate.



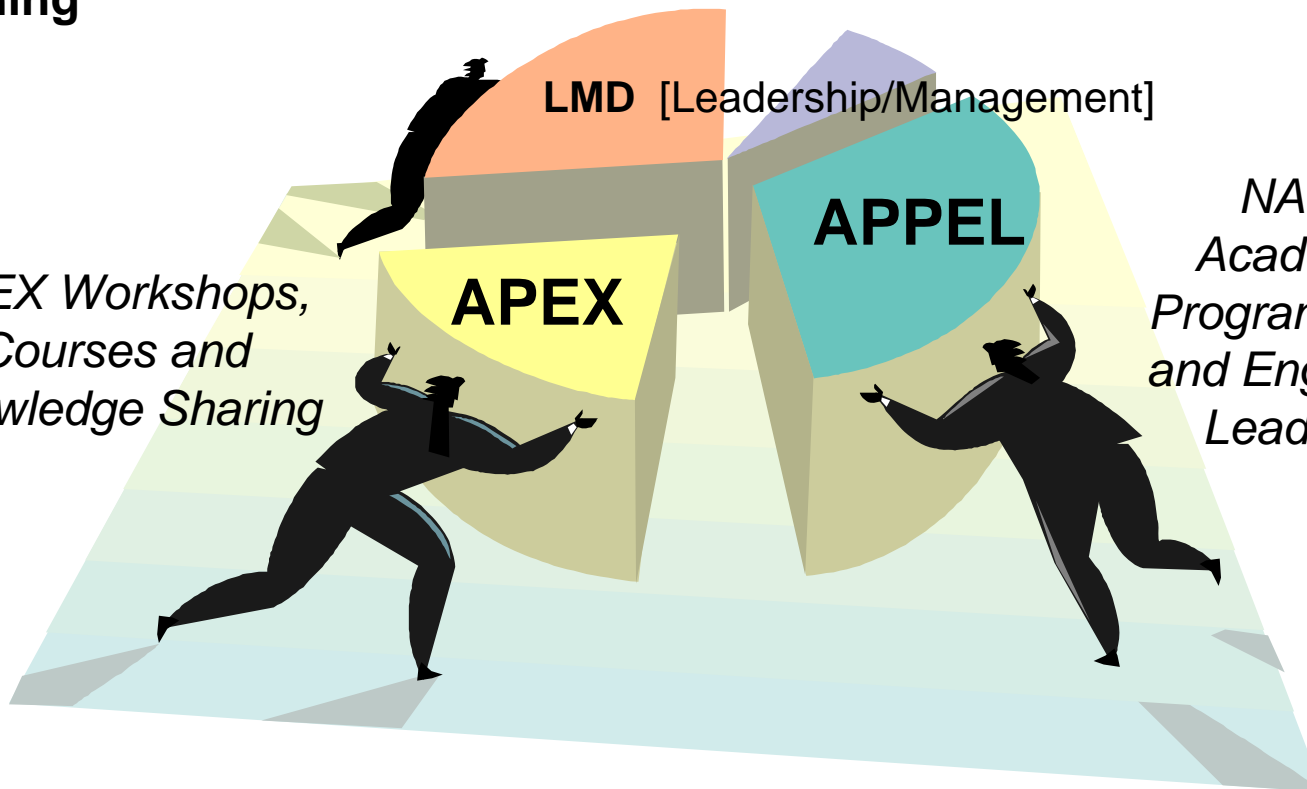
Classroom Training

➤ Tailored to Individual Development Plans (IDPs)

- ☐ Individual participants
- ☐ APEX pathways (PM and/or SE)

➤ Agency and Center Synergy

*APEX Workshops,
Courses and
Knowledge Sharing*

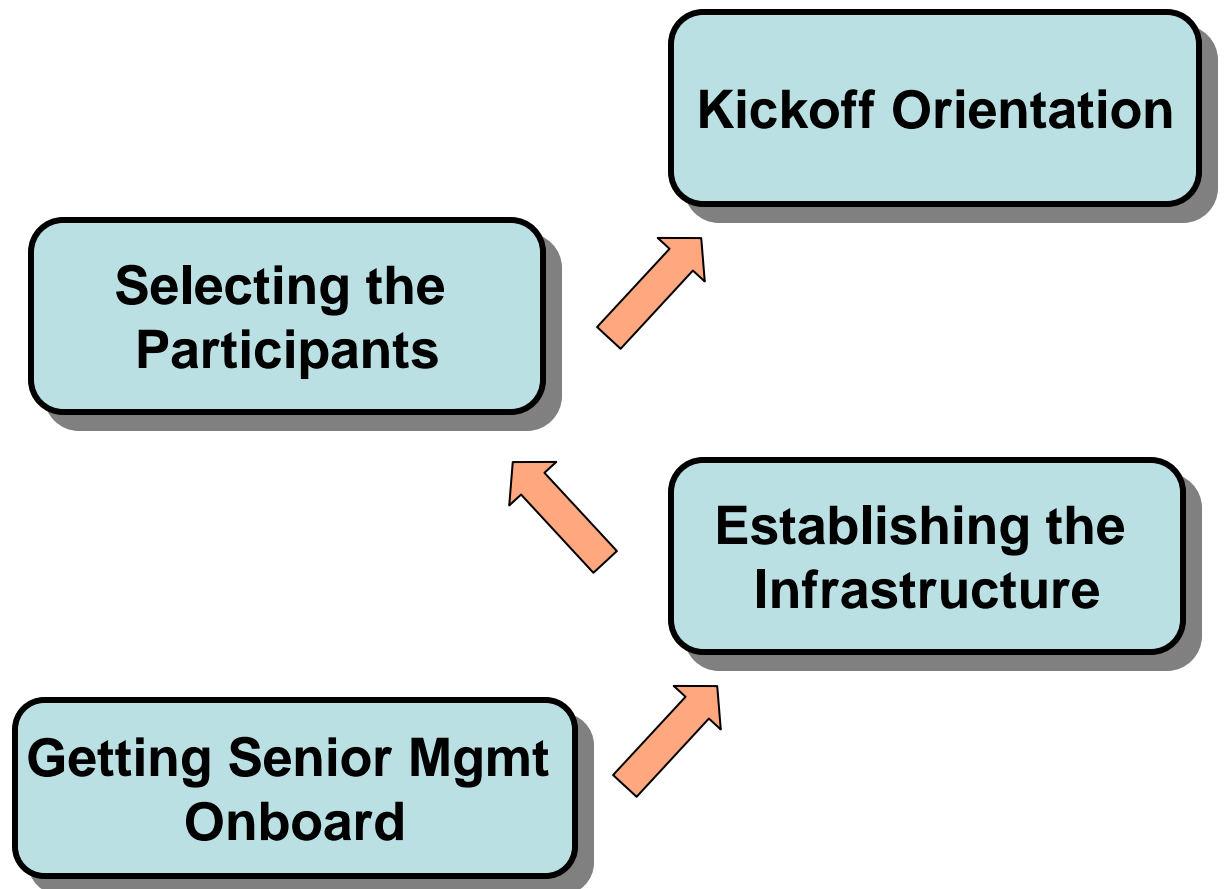


*NASA's
Academy of
Program/Project
and Engineering
Leadership*



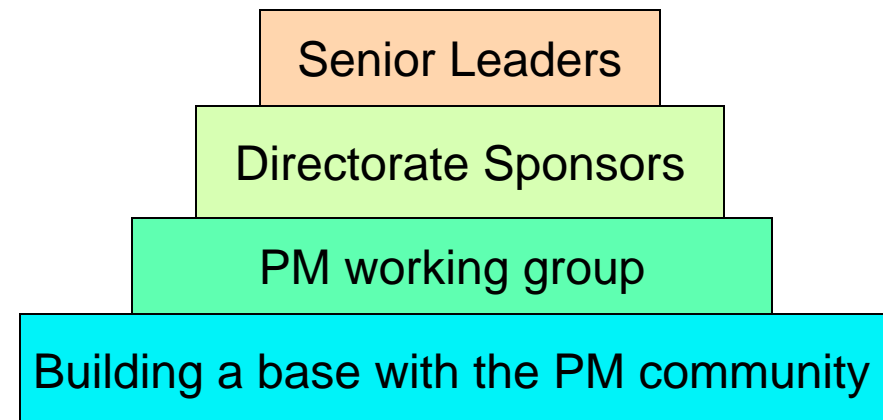
Launching the Program

Critical Initial Steps

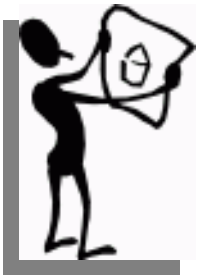


Getting Senior Management Onboard

- Grass roots advocacy by PM community and working group
- Briefings emphasized how the program would address both current and future needs
- Used experiences from other Centers to scope necessary resources
- Emphasized the program's innovative elements
- Incorporated their suggested ideas



Establishing the Infrastructure



- **Strong collaboration between the learning & development and the technical management organizations**
- **APEX Management**
 - Program Manager (David Bergner)
 - Deputy for Learning & Development (Claire Smith)
 - On the Job Training Coordinator
 - Curriculum Coordinator
 - Logistics and Admin (Julie Rivera)
- **APEX Development Council**
 - Cross-organization representatives
 - General program oversight
 - Evaluate candidates
 - Review participants progress at milestones
 - Provide organization support
 - Affirm graduation criteria satisfied

Selecting the Participants

- **Briefed organization directors on eligibility requirements**
- **Nominations made by supervisors, endorsed by organization directors**
- **Development Council evaluated and recommended candidates**
 - Current project criticality
 - Past performance and future potential
- **Senior Management gave final approval on participants**
 - Notification letters from Center Director



Kickoff Orientation



- Program overview, schedule, level of commitment required
 - Participants, supervisors, project managers, APEX staff, Development Council
- Mentors and participants matched and held a joint workshop
- Instructions and demonstration on APEX Online assessment tool
- Presented required and elective courses
- Explained the OJT assignment process



APEX Summary

- **Strategic program** mapped to Agency and Center priorities
- **Applies best practices** in learning and development
 - Success criteria
 - Integrated resources
 - Measurement
- **Active involvement of Center leadership, technical organizations and project practitioners.**